



# 2017 BASIC SCIENCE FOCUS FORUM

**October 11-12, 2017**

*(West Meeting Room 109-110)*

## Basic Science Committee

Edward J. Harvey, MD, Chair  
 Michael T. Archdeacon, MD  
 Mohit Bhandari, MD, PhD, FRCSC  
 Joseph Borrelli Jr., MD  
 Brett Crist, MD

Todd O. McKinley, MD  
 Tyler Morris, MD  
 Aaron Nauth, MD  
 Emil H. Schemitsch, MD

## Learning Objectives

Upon successful completion of this course, participants will be able to:

- Outline the biomechanical principles of injury
- Understand the implications of joint impact injuries
- Comprehend the clinical outcome scores used in orthopaedic research
- Discover new options for treatment of infection
- Explore the basic science and clinical outcomes of pain medication and their prescriptions
- Understand current concepts in tissue engineering.

The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of **11.75 AMA PRA Category 1 Credits™**. Physicians should claim only the credit commensurate with the extent of their participation in the activity.





# 2017 BASIC SCIENCE FOCUS FORUM

**Wednesday, October 11, 2017**

*(West Meeting Room 109-110)*

- 6:00 am **Speaker Ready Room**  
*(West Meeting Room 103)*
- 6:30 am **Registration**  
**Continental Breakfast**  
*(West Meeting Room Lobby – Outside Meeting Room)*
- 7:30 am **Introduction**  
*Edward J. Harvey, MD, Program Chair*

7:35 –  
8:45 am

## SYMPOSIUM 1: BIOMECHANICS-INJURY BIOMECHANICS OF FRACTURES

Moderators: *Pierre Guy, MD*  
*Peter Crompton, PhD*

- 7:35 am **Introduction: The Test Case of Hip Fractures**  
*Pierre Guy, MD*
- 7:40 am **How Bones Fail: Injury Biomechanics Primer**  
*Peter Crompton, PhD*
- 7:53 am **From Finite Elements to Clinical Use:  
Biofidelic Models for Hip Fracture Risk Screening**  
*Benedikt Helgason, PhD*
- 8:06 am **The Classics: In Vitro Stress and Fracture Under Different  
Loading Conditions**  
*Luca Cristofolini, PhD*
- 8:19 am **Accounting for Reality: Biofidelic Simulations of the Sideways Fall Impact**  
*Ingmar Fieps, MSc*
- 8:32 am Summary and Questions  
*Pierre Guy, MD*

Key:  $\Delta$  = presentation was funded by an OTA administered grant  
**Names in bold = Presenter**

8:45 –  
9:24 am**PAPER SESSION 1:  
APPLIED BIOMECHANICS**Moderators: *Pierre Guy, MD*  
*Peter Cripton, PhD*

- 8:45 am **Overview**  
*Pierre Guy, MD*
- 8:50 am **Do Promising Biomechanical Research Studies Lead to Clinically Meaningful Results?**  
(p. 59)  
PAPER #1  
*Jason R. Kang, MD; Grace Xiong; Julius A. Bishop, MD*
- 8:56 am **Δ Validation of the Radiographic Union Score for Tibial Fractures (RUST) Using Medical Imaging and Biomechanical Testing in an In-Vivo Rat Model**  
(p. 60)  
PAPER #2  
*Sandra Fiset, MSc; Meghan C. Crookshank, MD; Charles Godbout, PhD; Radovan Zdero, PhD; Aaron Nauth, MD; Emil H. Schemitsch, MD*
- 9:02 am **Long Segment Blocking Screws (LSBS) Increase Stability of Retrograde Nail Fixation in Geriatric Supracondylar Femur Fractures: Eliminating the “Bell-Clapper Effect”**  
(p. 61)  
PAPER #3  
*David Donohue; Darryl A. Auston; Kyle Stoops; Miguel Diaz, MS; Brandon Santoni, PhD; Hassan R. Mir, MD*
- 9:08 am **Bridge Plating Ostosynthesis: Effect of Bridge Span on Interfragmentary Motion**  
(p. 62)  
PAPER #4  
*Michael Bottlang; Julia Henschel, MS; Stanley Tsai, MS; Daniel C. Fitzpatrick, MD; Steven M. Madey, MD*
- 9:14 am Discussion
- 9:24 am Refreshment Break

9:35 –  
10:50 am**SYMPOSIUM 2:  
INFECTON-PREVENTION OF THE INFECTED FRACTURE:  
EVIDENCE BASED STRATEGIES FOR SUCCESS!**Moderators: *Emil H. Schemitsch, MD*  
*Cyril Mauffrey, MD, FACS, FRCS*

- 9:35 am **Introduction**  
*Emil H. Schemitsch, MD*
- 9:40 am **The Open Fracture: Are There Evidence Based Standards for Antibiotic Therapy?**  
*David J. Hak, MD*
- 9:50 am **How I Debride a High Energy Open Fracture**  
*Michael T. Archdeacon, MD*

## Δ OTA Grant

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.

## Basic Science Focus Forum – WEDNESDAY, OCTOBER 11, 2017

- 10:00 am **The Induced Membrane Technique: How to Optimize Outcome**  
*Cyril Mauffrey, MD, FACS, FRCS*
- 10:10 am **Management of Soft Tissue Defects: From Minor to Extreme**  
*Martin I. Boyer, MD*
- 10:20 am **Beyond the Fracture: Can the Patient be Optimized?**  
*Michael D. McKee, MD*
- 10:30 am **Adjuncts to Prevent Infection: Is Anything Ready for Prime Time?**  
*Peter V. Giannoudis, MD, FACS, FRCS*
- 10:40 am Discussion

10:50 –  
11:24 am

**PAPER SESSION 2:  
INFECTION**

Moderators: *Emil H. Schemitsch, MD*  
*Cyril Mauffrey, MD, FACS, FRCS*

- 10:50 am **Overview**  
*Emil H. Schemitsch, MD*
- 10:55 am **Immune Dysregulation in a Rat Model of Infected Femoral Segmental Bone Defect**  
(p. 63)  
PAPER #5  
*Hyunhee Ahn; Mara Schenker, MD; Rishin J. Kadakia; Pallab Pradhan; Laura D. Weinstock; Levi B. Wood; Krishnendu Roy; Robert E. Guldberg; Nick J. Willett*
- 11:01 am **Intrawound Vancomycin Powder Reduces *Staphylococcus aureus* Surgical Site Infections in a Rabbit Model**  
(p. 64)  
PAPER #6  
*James Paul Hovis, MD; Robert V. O'Toole, MD; Theodore T. Manson, MD; Mark E. Shirtliff, PhD; Manjari Joshi, MD; Roman Natoli, MD*
- 11:07 am **Intrawound Vancomycin Powder Reduces Bacterial Load in Contaminated Open Fracture Model**  
(p. 65)  
PAPER #7  
*Cyrus Theodore Caroom, MD; Dustin Moore, MD; Nithya Mudaliar, MS; Craig Winkler, MD; Jefferson Jacob Murphree, MD; Ian Ratheal, MD; Michael Fry, BS; Jessica Tullar, PhD MPH; Abdul Hamood, PhD*
- 11:13 am **Release of Vancomycin and Tobramycin from PMMA Cements Impregnated with Calcium Polyphosphate Hydrogel**  
(p. 66)  
PAPER #8  
*David C. Markel, MD; Wei Song, PhD; Weiping Ren, PhD*
- 11:19 am Discussion

## Basic Science Focus Forum – WEDNESDAY, OCTOBER 11, 2017

11:30 am-12:30 pm **INTERNATIONAL INDUSTRY LUNCH SYMPOSIUM**  
*West Ballroom CD* **Zimmer Biomet**  
 (No CME credits offered)  
 Moderators: *Steven A. Olson, MD*  
*Peter V. Giannoudis, MD, FACS, FRCS*

11:30 am **Augmented Fixation Advances in Trauma**  
 Faculty: *Thomas A. (Toney) Russell, MD*  
*John A. Scolaro, MD*

*West Ballroom CD*

**SYMPOSIUM 3:**

**12:35 – 1:50 pm JOINT SESSION WITH INTERNATIONAL SURGICAL GROUP-  
 JOINT IMPACT INJURIES OF THE LOWER EXTREMITY**

Moderators: *Peter V. Giannoudis, MD, FACS, FRCS*  
*Joseph Borrelli Jr., MD*

- 12:35 pm **Introduction**  
*Peter V. Giannoudis, MD, FACS, FRCS*
- 12:40 pm **The Basic Science/Molecular Make-up and Response to Compression  
 of Articular Cartilage**  
*Joseph Borrelli Jr., MD*
- 12:52 pm **The Role of Residual Articular Incongruity and Joint Instability  
 in the Progression of PTOA?**  
*Steven A. Olson, MD*
- 1:04 pm **Modulation of Cartilage's Response to Injury:  
 Can Chondrocyte Apoptosis be Reversed?**  
*Peter V. Giannoudis, MD, FACS, FRCS*
- 1:16 pm **Effectiveness of Cellular and Growth Factors for the Treatment of  
 Injured Articular Cartilage**  
*Emil H. Schemitsch, MD*
- 1:28 pm **Current Tissue Engineering Approaches to Regenerate Cartilage**  
*James P. Stannard, MD*
- 1:40 pm Discussion
- 1:50 pm Break / Walk Back to BSFF Room (*West Meeting Room 109-110*)

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## Basic Science Focus Forum – WEDNESDAY, OCTOBER 11, 2017

2:00 –  
2:40 pm**PAPER SESSION 3:  
GENERAL TRAUMA**Moderators: *Peter V. Giannoudis, MD, FACS, FRCS*  
*Joseph Borrelli Jr., MD*

2:00 pm

**Overview***Joseph Borrelli Jr., MD*2:05 pm  
(p. 67)

PAPER #9

**Synovial Fluid Analysis Reveals a Novel Panel of Biomarkers  
Altered Following Articular Fracture***Steven A. Olson, MD; Bridgette D. Furman; Janet Heubner, MS; Farsh Guilak, PhD;*  
*Yi-Ju Li, PhD; Kelly Kimmerling; Yi-Hung Wu, PhD; Virginia B. Kraus, MD, PhD*2:11 pm  
(p. 68)

PAPER #10

**Hemorrhagic Shock and Surgical Strategy (Nailing versus External Fixation)  
Affect the Microcirculation in Soft Tissues***Roman Pfeifer, MD; Klemens Horst, MD; Zhi Qiao; Michel Teuben;*  
*Frank Hildebrand, MD; Hans-Christoph Pape, MD*2:17 pm  
(p. 69)

PAPER #11

**The Gut Microbiome: What Effect Does Our Diet Play in Fracture Healing?***Ashlee MacDonald, MD; Christopher Farnsworth, PhD Student;*  
*Eric Schott, PhD Student; Alex Grier; Steven Gill, PhD; Hani Awad, PhD;*  
*Michael Zuscik, PhD; Robert Mooney, PhD; John P. Ketz, MD*2:23 pm  
(p. 70)

PAPER #12

**Can Intramuscular pH Levels Diagnose Acute Compartment Syndrome?***Christopher Doro, MD; David Hennessy, MD; Robert V. O'Toole, MD;*  
*Thomas F. Higgins, MD*

2:29 pm

Discussion

2:40 –  
3:55 pm**SYMPOSIUM 4:  
TISSUE ENGINEERING—FACT OR FICTION?**Moderators: *Brett D. Crist, MD, FACS*  
*Mark Lee, MD*

2:40 pm

**Introduction***Brett D. Crist, MD, FACS*

2:45 pm

**How to Make a Bone in 2017***Mark Lee, MD*

3:00 pm

**Can We Get a Scaffold to Really Work?***Kent Leach, PhD*

3:15 pm

**What are the Cartilage Options for Trauma Applications?***Brett D. Crist, MD*

3:30 pm

**Have We Made Any Head Way in Soft Tissue Engineering?***Kent Leach, PhD*

3:45 pm

Discussion

See pages 401 - 442 for financial disclosure information.

3:55 –  
4:56 pm

**PAPER SESSION 4:  
MANIPULATING HEALING**

Moderators: *Brett D. Crist, MD, FACS*  
*Mark Lee, MD*

- 3:55 pm           **Overview**  
*Mark Lee, MD*
- 4:00 pm  
(p. 71)  
PAPER #13       **Designer Chimeric Protein BV-265 Composite Matrix Demonstrates Efficacy in Nonhuman Primate Bone Repair Models at Substantially Lower Concentrations than BMP-2/Absorbable Collagen Sponge**  
*Howard Seeherman, PhD, VMD; Stephen Berasi, PhD; Marc Bohner, PhD; Christopher Brown, PhD; Orly Grinberg, PhD; Pablo Morales, DVM; Eric Vanderploeg, PhD; Christopher Wilson, PhD; John M. Wozney, PhD*
- 4:06 pm  
(p. 72)  
PAPER #14       **Adjunctive Immunomodulation Improves Efficacy of Autologous Minced Muscle Graft in a Porcine Model of Volumetric Muscle Loss**  
*Benjamin T. Corona, PhD; Jessica C. Rivera, MD; Joseph C. Wenke, PhD; Sarah M. Greising, PhD*
- 4:12 pm  
(p. 73)  
PAPER #15       **Δ Effect of Cold Therapy on Bone Healing**  
*Daniel Castano, MD; Jose Ramirez-GarciaLuna, MD, MsC; Geraldine Merle, PhD; Edward J. Harvey, MD, MsC*
- 4:18 pm           Discussion
- 4:28 pm  
(p. 74)  
PAPER #16       **Hypoxic Preconditioning of Mesenchymal Stem Cell Spheroids Stimulates Segmental Bone Defect Repair**  
*Nasser Heyrani, MD; Steve Shih-Yang Ho; Ben Pen Jui Hung, PhD; Mark Lee, MD; Jonathan Kent Leach, PhD*
- 4:34 pm  
(p. 75)  
PAPER #17       **Δ Platelet-Rich Plasma as a Vehicle for Endothelial Progenitor Cell Delivery in Critical-Sized Bone Defects**  
*David Ramnarain; Charles Godbout, PhD; Brent Bates; Emil H. Schemitsch, MD; Aaron Nauth, MD*
- 4:40 pm  
(p. 76)  
PAPER #18       **Δ Aminocaproic Acid Inhibits Periosteal Chondrogenesis and Promotes Periosteal Osteogenesis during Fracture Healing**  
*Dalibel M. Bravo, MD; Anna Josephson, MS; Vivian Bradaschia Correa, PhD; Jason Huo, BS; Philipp Leucht, MD*
- 4:46 pm           Discussion
- 4:56 pm           Adjourn for the Day

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# 2017 BASIC SCIENCE FOCUS FORUM

**Thursday, October 12, 2017**

*(West Meeting Room 109-110)*

- 6:00 am **Speaker Ready Room**  
*(West Meeting Room 103)*
- 6:30 am **Registration**  
**Continental Breakfast**  
*(West Meeting Room Lobby – Outside Meeting Room)*
- 7:30 am **Introduction**  
*Edward J. Harvey, MD, Program Chair*

## SYMPOSIUM 5:

7:35 –  
8:30 am

### **PATIENT OUTCOMES IN ORTHOPAEDICS- HOW TO EVALUATE IF YOUR TREATMENT IS REALLY WORKING**

Moderators: *Mohit Bhandari, MD, PhD, FRCSC*  
*Aaron Nauth, MD*

- 7:35 am **Lower Extremity Outcomes in Trauma Patients**  
*Paul Tornetta III, MD*
- 7:45 am **Upper Extremity Outcomes in Orthopaedic Trauma**  
*Peter Cole, MD*
- 7:55 am **How Big of a Difference is Clinically Important?  
Using MCID in Orthopaedic Trauma**  
*Gerard Slobogean, MD*
- 8:05 am **General Health Outcomes and Economic Analysis:  
How to Determine if the Cost Treatment is Worth It**  
*Samir Mehta, MD*
- 8:15 am **The Impact of Psychosocial Factors on Outcomes in Orthopaedic Trauma**  
*William Obrebsky, MD*
- 8:25 am Discussion



8:30 –  
9:27 am**PAPER SESSION 5:  
DOING IT BETTER**Moderators: *Mohit Bhandari, MD, PhD, FRCSC*  
*Aaron Nauth, MD*

- 8:30 am **Overview**  
*Aaron Nauth, MD*
- 8:35 am **Negative Effects of Age-Related Chronic Inflammation on Skeletal Stem Cells**  
(p. 77)  
PAPER #19  
*Anna Josephson, MS; Vivian Bradaschia Correa, PhD; Shane Neibart, BS; Philipp Leucht, MD*
- 8:41 am **Effect of Nifedipine and Ketotifen on Joint Capsule Cell Based Collagen Gel Contraction**  
(p. 78)  
PAPER #20  
*Kristi Billard, BSc; Mei Zhang, MD; Prism S. Schneider, MD, PhD; Dave Hart, PhD; Paul T. Salo, MD; Kevin Hildebrand, MD, FRCSC*
- 8:47 am **Reduction in Angiogenic Support is the Primary Defect of Mesenchymal Stromal Cells Resident at the Site of Long Bone Non-Union**  
(p. 79)  
PAPER #21  
*Richard James Cuthbert; Sarah M. Churchman; Penelope Castana, PhD; Hiang Boon Tan; Dennis McGonagle; Evangelia Papadimitriou, PhD; Elena Jones; Peter V. Giannoudis, MD*
- 8:53 am Discussion
- 9:01 am **An Evaluation of Bone Marrow Aspirate Concentrate in Osteointegration of Fresh Osteochondral Allografts**  
(p. 80)  
PAPER #22  
*James P. Stannard, MD; James Cook, PhD; Brett D. Crist, MD*
- 9:07 am **Femoral Neck Exposure for the Smith-Petersen Versus the Watson-Jones Approach**  
(p. 81)  
PAPER #23  
*Paul Lichstein, MD, MS; John P. Kleimeyer, MD; Michael Githens, MD; John S. Vorhies, MD; Michael J. Gardner, MD; Michael J. Bellino; Julius A. Bishop, MD*
- 9:13 am **Δ The Effect of Smoking Cessation on Serum Biomarkers of Fracture Healing**  
(p. 82)  
PAPER #24  
*Justin Kleiner, BS; Joseph Johnson, MD; Jeremy Truntzer; Scott McAllister; Matthew Edward Deren; Mursal Gardezi; Olivia Cummings; Melanie Ambler; Dioscaris Garcia; Christopher T. Born, MD*
- 9:19 am Discussion
- 9:27 am Refreshment Break

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## Basic Science Focus Forum – THURSDAY, OCTOBER 12, 2017

9:40 –  
10:35 amSYMPOSIUM 6:  
SCIENCE BEHIND PAIN MANAGEMENTModerators: *Todd O. McKinley, MD*  
*William T. Obremskey, MD*

- 9:40 am **Overview**  
*Todd O. McKinley, MD*
- 9:45 am **Current Epidemiology and Extent of Our Problems**  
*Hassan Mir, MD*
- 9:55 am **Pain Control - Pharmacology and Different Mechanisms of Pain**  
*Anna Miller, MD*
- 10:05 am **Clinical Management - Blocks, Multimodal, Medication Protocols and Contracts**  
*Joseph Hsu, MD*
- 10:15 am **Health Policy - State, Federal, Insurer and Pharmacy Regulations**  
*A. Alex Jahangir, MD*
- 10:25 am Discussion

10:35 –  
11:05 amPAPER SESSION 6:  
PAIN MANAGEMENTModerators: *Todd O. McKinley, MD*  
*William T. Obremskey, MD*

- 10:35 am **Overview**  
*Todd O. McKinley, MD*
- 10:40 am (p. 83)  
PAPER #25 **Reliability of Proxy-Reported PROMIS Physical Function and Pain Interference to Measure Outcomes in Elderly Patients Following Musculoskeletal Trauma**  
*Maria Loreto Alvarez-Nebreda, MD, PhD; Marilyn Heng, MD, MPH; Bernard Rosner, PhD; Michael F. McTague, MPH; Houman Javedan, MD; Mitchel B. Harris, MD; Michael John Weaver, MD*
- 10:46 am (p. 84)  
PAPER #26 **Overprescription of Opioids at Discharge in Patients After Fracture Surgery**  
*Eric Chen, MD, PhD; Lulu Li, BS; Paul Tornetta III, MD*
- 10:52 am (p. 85)  
PAPER #27 **Prescription Reporting with Immediate Medication Utilization Mapping (PRIMUM): Impact of an Alert on Controlled Substance Prescribing**  
*Rachel Seymour, PhD; Meghan Kusper Wally, MPH; Sharon Schiro, PhD; Joseph R. Hsu, MD; PRIMUM Group*
- 10:58 am Discussion
- 11:05 am **INDUSTRY LUNCH SYMPOSIA** (*On-site Registration Available*)  
Boxed Lunch Included

See pages 401 - 442 for financial disclosure information.